

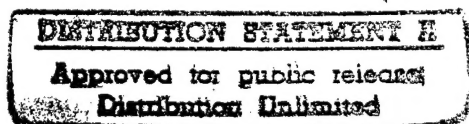
THE WORLD AIRPOWER COMPENDIUM

A Technology Product

Presented To

The Directorate of Research

Air Command and Staff College



In Partial Fulfillment of the Graduation Requirements of ACSC

by

Maj Mark S. Blackburn
Maj Christopher C. Bogdan
LCDR William J. Bradford
Maj Tayyip Ozsever

DTIC QUALITY INSPECTED 3

19971126 109

April 1996

gc

Disclaimer

The views expressed in this academic research paper are those of the authors and do not reflect the official policy or position of the US Government or the Department of Defense.

Contents

	<i>Page</i>
DISCLAIMER.....	ii
LIST OF ILLUSTRATIONS.....	v
LIST OF TABLES	vi
PREFACE	vii
ABSTRACT	ix
INTRODUCTION.....	1
Background.....	1
Objective.....	2
ToolBook Uses/Value	3
IMPROVEMENTS/METHODOLOGY	5
Introduction	5
Program Design Improvements	5
Roundels/Fin Flashes.....	7
Country Descriptions.....	8
Nations with No Air Assets.....	11
Inventory Data	12
Presentation of Inventory Data	15
ADMINISTRATION AND RECOMMENDATIONS	18
ToolBook Use.....	18
Distribution.....	20
Recommendations for Future Research.....	20
SUMMARY	22
APPENDIX A: CURRENT WORLD AIRPOWER COMPENDIUM TOOLBOOK USERS.....	23
APPENDIX B: TYPICAL LETTER TO ACCOMPANY FINAL PRODUCT (FOREIGN NATIONS).....	25

APPENDIX C: PROGRAM LOADING INSTRUCTIONS	27
BIBLIOGRAPHY	29

Illustrations

	<i>Page</i>
Figure 2-1. Sample Printout Using the Print Function.....	7
Figure 3-1. Sample “Country” Page.....	19

Tables

	<i>Page</i>
Table 2-1. Primary Sources for Inventory Data.....	13
Table 2-2. Comparison of Inventory Data (Mali MiG-21s)	14

Preface

An AY95 ACSC student research team created the original *World Airpower Compendium* and released it in May 1995. It provided an easy to use compilation of the airpower assets of all the world's nations. Unfortunately, the original version was incomplete and, in some instances, inaccurate. However, because the project has the potential to be a valuable tool for professional military students, faculty, and war game designers, we decided to improve upon last year's version. Although our team was considerably smaller than last year's (4 officers vice 13 officers), we have significantly improved the *World Airpower Compendium* by making it simpler to use and more in-depth, comprehensive, and accurate. We did not change the basic structure of the ToolBook; however, we made the ToolBook much more user friendly and changed its content. Aircraft roundels and fin flashes were updated and corrected. Country descriptions now create a clear picture of the distribution, organization, and roles/missions of a nation's air assets. Aircraft inventories are now all complete and accurate. On the whole, we now feel that the *World Airpower Compendium* is the most current, precise, and comprehensive airpower data base in publication. It is a "must have" reference source for airpower students, educators, and war gamers.

We gratefully acknowledge the assistance of our faculty advisor, Wing Commander Michael Canavan, RAF, who provided strategic guidance and many insights while revising last year's product. Special thanks to LCDR Dave "Arlo" Guthrie, USN, and Lt.

Col. Dan Novak, USAF. They provided outstanding technical assistance in solving various software problems.

Abstract

In today's rapidly changing world a current, accurate, and easily accessible data base of all the world's airpower assets is valuable to military students, educators, and war gaming professionals alike. The *World Airpower Compendium* provides a comprehensive picture of the airpower assets of all the world's nations as of April 1996. This unclassified data base couples accurate, up to date aircraft inventories with a description of how nations distribute, organize, and use their air assets. The resulting computer product, developed using Assymetrix Corporation's ToolBook software, rivals many of today's prominent airpower references. The ToolBook uniquely integrates large volumes of dispersed and difficult to find information into a single, easy to use product. It provides a wealth of information at the click of a mouse button.

Initially, this year's team collected data from leading unclassified sources and used various techniques to resolve data conflicts among these sources. The resulting compilation of aircraft inventories represents the most accurate estimates currently available. A narrative describing organization and distribution of a nation's air assets, the fin flash/roundel found on its military aircraft, and current trend information for each nation were combined with this inventory data to provide a complete picture of each nation's airpower situation. All this information was then incorporated into a ToolBook application that is easy to use, attractive, and entertaining.

The *World Airpower Compendium* stands alone as a superior source of current air asset information for all the world's nations. It will be updated annually at the United States Air Command and Staff College and is now available on the Internet.[®]

Chapter 1

Introduction

Background

Any assessment of a nation's military power must necessarily begin with the nation's "order of battle"—the quantity and types of military hardware the nation possesses. The *World Airpower Compendium* is an unclassified computer database that deals with a significant component of this military hardware—airpower assets. Presented in Tool-Book format, it provides a complete picture of the airpower assets of all the world's nations as of April 1996. It couples current and precise aircraft inventories with a description of how a nation distributes, organizes, and uses its air assets. Such a database can be of significant value to military students, educators, and war game designers who must presently sift through various reference books and periodicals to obtain the same information. The *World Airpower Compendium* smoothly integrates information from a multitude of quality sources into a single, easy to use, unique computer ToolBook.

The original edition of the *World Airpower Compendium* was somewhat incomplete and not wholly accurate and this greatly detracted from its utility and overall value. The 1996 edition is a more comprehensive and accurate version of the original. This paper will highlight the improvements made by this year's team, the methodology used to make

these improvements, and the reasoning behind these changes. First, the objective of this year's research and the potential value of the ToolBook will be discussed. Then, the improvements and the corresponding methodologies will be outlined followed by a discussion of the ToolBook's use, its distribution, and some recommendations for future editions.

Objective

"The purpose of the *World Airpower Compendium* is to provide a product of current and lasting value to professional military educational institutions."¹ It attempts to facilitate the learning process by providing the student, educator, and war gamer with a user-friendly database of each nation's air assets.² A polished, well-organized, well-researched product could be quite useful for a variety of academic endeavors. However, such a product runs the risk of being less than effective if it is not complete, current, and accurate. As Dr. Mueller of the School of Advanced Airpower Studies stated, "the risk in such an undertaking is that less than a high quality job will produce something which is little better and less convenient to use than *Military Balance*, which in spite of its shortcomings, can be held between two fingers and read without electricity."³ Unfortunately, in various respects the original version of the *World Airpower Compendium* was not the high quality product envisioned. As a result, the primary goal of this year's research team was to turn the *World Airpower Compendium* into a truly world-class product. The team wanted the ToolBook to become the premier unclassified reference document for airpower assets.

With only a four man team, the project's scope was necessarily limited. The team basically left the ToolBook's architecture intact because the format was effective and relatively easy to use. They were also concerned that expanding the ToolBook to include photos, video, and sound would create a large software requirement which many of the current users could not support. Additionally, creating a large ToolBook would make distribution more difficult and expensive. Consequently, the team instead focused their efforts on the content of the ToolBook. They emphasized substance over superficial style.

ToolBook Uses/Value

An improved *World Airpower Compendium* will be valuable for many reasons. Today's global order remains in transition and the balance of power throughout the world is in constant flux. One needs only to look at the emerging nations spawned from the break-up of the former Soviet Union or shifting political boundaries in the Balkans to recognize this. For military students, educators, and war game designers understanding these changes and planning military activities, even in the academic environment, becomes a challenge. The *World Airpower Compendium* will help create some order within this shifting global landscape. It will keep them abreast of the world's current airpower situation and can be used to develop more realistic war gaming scenarios. It may also be used as part of a larger analysis of the fielded military forces of a particular nation or region and can serve as a starting point for a balance of power analysis within a given region.

Notwithstanding all of the above uses, the ToolBook's greatest value is its "one-stop shopping" characteristic. It integrates a tremendous amount of information, collected from a multitude of quality sources, into a single, quick-reference format. Users do not have to go to the library and sift through volumes of books and periodicals to gather current airpower data. The *World Airpower Compendium* provides them a wealth of knowledge with the click of a mouse button.

Notes

¹ Jaber Al-Ghatam et al., "The World Air Power Compendium," Project 95-001, (Maxwell AFB, Ala.: Air University Press, April 1995), 3.

² Ibid., 3.

³ Karl Mueller, "Evaluation of ACSC Research Project 95-001," (School for Advanced Airpower Studies, Air Universtiy, Maxwell AFB, Ala., May 1995), 1.

Chapter 2

Improvements/Methodology

Introduction

The purpose of this section is to explain how and why this year's team changed the *World Airpower Compendium*. While it is not the intent of this section to point out inadequacies and errors within the first edition, it is necessary to highlight some of these problems so the reader can gain a sense of the magnitude of improvements and level of effort made by this year's research team. The team substantially changed five areas: Program Design, Roundels/Fin Flashes, Country Descriptions, Inventory Data, and Presentation of Inventory Data.

Program Design Improvements

The team made four primary design modifications. All attempted to make the product more user friendly, efficient, and effective. The first changed how the inventory data was grouped. In the original ToolBook there were six aircraft categories to choose from for each individual nation: Fighter/Attack, Bomber, Reconnaissance, Transport, and Trainer. The new edition has folded the Bomber section into the Fighter/Attack section and renamed it "Combat" aircraft. The team did this because the distinction between bomber and fighter aircraft is often blurry and also because only 11 of 188 countries

actually had bomber aircraft in the classic "strategic bomber" sense. Additionally, the team changed the "Reconnaissance" category to "Combat Support" to reflect the wide variety of support aircraft found in that section. Thus, the six old groupings were replaced by five: Combat, Combat Support, Transport, Helicopter, and Trainer.

The second change involved removing needless buttons from the "country" pages. In the original version, if a nation had no transport aircraft (for example) actuation of the transport button on that country's page would result in the following statement, "Sorry, Country X has no transport aircraft." The ToolBook had over 300 of these statements needlessly scattered throughout, making its operation tedious and unfriendly. In this year's version, if a country did not have a particular aircraft type, then that button was removed from the country's page. The user now doesn't have to waste time selecting buttons that have no associated aircraft. The user may now make the assumption that if the button does not exist, then the country does not have that type of aircraft. As a result, operation is now much more efficient and less tiresome.

Thirdly, the team redesigned the index page. Instead of having to scroll through 190 entries to get to the last nations in the index (such as Zambia, Zimbabwe, etc.) a simple page by page index was created. Now the user can get to *any* entry in the index with a single mouse click.

The final change fixed the print function. In the original version the print function was not operational. Now the user can easily obtain a hard copy report similar to the example in Figure 2-1 below. The ability to obtain a hard copy report for any or all of the nations in the ToolBook greatly enhances its value as a "desk top" reference.

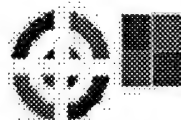
Country	Dominican Republic	
Description	The Dominican Republic, located in the Greater Antilles, occupies the eastern half of the same landmass as Haiti. The Dominican Republic is a unitary republic with an executive president and a bicameral legislature. The country has an active Army, Navy, Air Force, and National Police. The Dominican Air Force controls all air assets and is organized into a fighter-bomber squadron, transport squadron, and a Military Aviation School. Primary missions include transportation, internal policing and a limited ground attack/counter-insurgency role.	
Combat	Cessna A-37B Dragonfly	8
Combat Support	Cessna 337 (Q-2A) Skymaster	6
	Beech Queen Air 80	3
Transport	Douglas C-47 Dakota	3
	Rockwell Shrike Commander 680	2
	Piper PA-31 Navajo	2
	Cessna 240	1
Helicopter	Bell B 205 / UH-1H Iroquois	9
	Sud SA 313 Alouette II	2
	Sud SA 316 Alouette III	1
	Aérospatiale AS 365C Dauphin 2	1
	McDonnell Douglas Hughes 369	1
	McDonnell Douglas Hughes 500	1
Training	Beech T-34B Mentor	10
Fin flash		

Figure 2-1. Sample Printout Using the Print Function

Roundels/Fin Flashes

Although enhancing the ToolBook's operation was important, improving its content was seen as vital. In the original version of the ToolBook, 23 countries were missing roundels and fin flashes. In addition, six nations had outdated roundels and five had roundels of very poor quality. The methodology for redressing these omissions was simple, hard-nosed research. By scanning countless books and periodicals, this year's team found 20 of the 23 missing roundels. Some were found in the "Roundel Foldout

Supplement” of the June 1995 issue of *Air Forces Monthly*. Others were identified through current aircraft pictures found in the *Encyclopedia of the World's Air Forces* and the *Naval Institute Guide to World Military Aviation*, and in one case the fin flash for aircraft from Belarus was found in photos from an article entitled “White Russia” in the October 1995 issue of *Air Forces Monthly*. Finding unique and sometimes hidden information such as Belarus’ aircraft fin flash was absolutely critical in creating a comprehensive product. Regrettably, the research team could not positively identify the roundels of Hong Kong, Fiji, and Turkmenistan. In each case, pictures of these nation’s air assets were found, but the fin flashes or roundels could not be discerned or verified. Consequently, the team used their national flag as a substitute, along with notation explaining this substitution.

Country Descriptions

One of the greatest drawbacks to the effectiveness and value of the original ToolBook was the superficial, inconsistent, and unbalanced country descriptions. This section of the ToolBook has the greatest potential for creating a clear picture of a nation’s airpower situation by coupling how a nation distributes, organizes, and uses its airpower assets with its inventory data. This potential was squandered in the original version. The descriptions for many nations were inadequate one line sentences such as “Congo’s military is assisted by Russian Military advisers.” In numerous other cases the description contained the following: “No information is available on the Air Force’s roles and missions or its organization.” Additionally, when there was at least some form of description it did not contain information about how a nation’s airpower assets were

distributed among various defense components (e.g., Navy, Army, Marines). On the whole, this area provided one of the best opportunities to improve the ToolBook.

This year's team standardized the country descriptions by using a consistent format which included the information described below. The rationale for why this information was added is also included in the discussion.

Nation's General Location and Bordering Countries. Many nations do not possess air assets sufficient for global power projection, consequently their regional neighbors constitute their near and far horizons. By presenting written information about a nation's regional location and who its neighbors are, the ToolBook can serve as the departure point for a regional balance of power analysis.

Form of Government and National Defense Structure. The team included each nation's form of government in the description. This contextual information can help in analyzing a particular nation's airpower assets. The components of national defense (i.e. Army, Navy, Air Force, etc.) were also included to allow for an easy transition in explaining how a nation distributes its air assets among these various components.

Distribution, Organization, and Roles and Missions. This information is the core of the country description. How a nation distributes, organizes, and uses its air assets is the vital link to the inventory data. Without this information, the inventory data is just a list of aircraft. With it, a clearer picture of a nation's airpower situation emerges.

Current Trend Information. In order to provide a truly current product, a portion of the country description was devoted to the most recent trends or changes to a nation's airpower assets. The team highlighted the paths individual nations are taking to improve or change their airpower situation. They performed a thorough survey of the latest

volumes of *World Air Power Journal* and *Flight International* to provide the most current information concerning aircraft upgrades, purchases, transfers, or changes in inventory. The team made over 150 entries and changes as a result of this survey, making the ToolBook a truly current database.

Perhaps the best way to demonstrate the significant enhancement resulting from the new country descriptions is through a comparison of a previous and current description. The following is the country description for Sweden in the original version:

Most of the Air Force is built on domestic production. Sweden has plans to modernize its small fleet with [the] new JAS 39 Gripen (sic).

The updated version paints a more comprehensive picture:

Sweden is located in northern Europe bordering the Baltic Sea between Norway and Finland. This constitutional monarchy maintains an Army, Navy, and Air Force. Air assets are distributed among the three services. The Swedish Naval Air Service is organized into 3 helicopter squadrons used for anti-submarine warfare, over the horizon target acquisition for surface vessels, and general transport duties. The Navy also has operational control of various fixed wing aircraft used for liaison and pollution control. The Swedish Army Air Corps maintains both fixed wing aircraft and helicopters for casualty evacuation, personnel/cargo transportation, scouting and reconnaissance, and anti-tank missions (armed MBB Bo.105 helicopters). The Air Force maintains the lion's share of the air assets although in recent years budget constraints have resulted in a drawdown in the overall number of fighter squadrons from 20 to a projected 16 by the year 2000. The JAS 39 Gripen is currently undergoing extensive flight test and Sweden plans to obtain 140 single seat and 14 tandem seat Gripens to replace Draken and Viggen aircraft in the interceptor and reconnaissance roles. Initial operational capability is planned for 1997.

Coupling an informative description like the one above with a current, accurate aircraft inventory creates a much clearer picture of a nation's airpower structure and purpose. With all 188 country descriptions revitalized to this standard the ToolBook is a much richer, more effective, and useful product.

Nations with No Air Assets

The original version of the ToolBook presented nations with no air assets in an abrupt, inadequate manner. A simple statement, "Sorry, Country X has no Air Force" was all that was provided for these nations. This year's team took a different approach and provided each of these 19 nations with a data page and narrative description similar to the other nations' descriptions. If possible the narrative included why the nation has no air assets. The country description in the ToolBook for the Marshall Islands serves as a good example:

The Marshall Islands are located in the North Pacific Ocean, two-thirds the way between Hawaii and Papua New Guinea. This island nation has a constitutional parliamentary government in free association with the United States. Its defense is the responsibility of the United States; consequently, it has no defense forces or air assets.

There were two reasons behind this expansion. First, adding these nations to the ToolBook keeps the product consistent with each nation in the world having its own page. This also simplifies a future research team's task of updating the ToolBook if any of these nations obtains air assets. Secondly, knowing that a nation has no air assets, and why it has none, can be important when performing a balance of power analysis within a region. Such data provides the student or war gamer with a more complete regional picture.

For similar reasons, the team also added Taiwan and Hong Kong to the ToolBook. These two "entities," while not independent nations, possess air assets which play a vital role in their respective regions. In Taiwan's case, these air assets constitute a substantial military capability and cannot be considered part of the military arsenal of the People's

Republic of China. Adding these two political entities makes the ToolBook more complete.

Inventory Data

The inventory data for each nation is the cornerstone of the *World Airpower Compendium*. While it is difficult, if not impossible, to ascertain the exact aircraft inventory of any given nation, a review of the original ToolBook indicated that its accuracy could be greatly improved. There were 8 countries improperly identified as having no airpower assets: The Bahamas, Eritria, Estonia, Sierra Leone, Liberia, Namibia, Tajikistan, and Maldives. Compounding this problem was the mixing of aircraft types (fighters in the transport section, helicopters in the fixed-wing sections etc.) throughout the ToolBook. It was also apparent that last year's team compiled some nations' airpower inventories from a single, out of date source. The one single error in last year's version which best illustrates this accuracy problem was the declaration that Iraq had no helicopters in her inventory! Overall, this year's team had little confidence that the numerical picture presented by the *World Airpower Compendium* was wholly accurate or current. Consequently, they started from "ground zero" in rebuilding this portion of the ToolBook.

Before discussing the methodology used to determine the aircraft inventories, it is important to understand the uncertainty involved in executing such a task. As Rene Francillon states in the preface to his book *Naval Institute Guide to World Military Aviation 1995*, "Ascertaining the aircraft inventory of any given air force is hardly an exact science."¹ The best one can hope for is a sort of "census" or a "best guess estimate"

derived from multiple sources.² This year's team understood that there were no definitive answers in creating accurate inventory data, so they set out to provide the best possible "estimates." They first selected a sufficient number of credible sources. The following table is a list of the primary sources used:

Table 2-1. Primary Sources for Inventory Data

<i>Military Balance 1994–1995 and 1995–1996</i>
<i>Jane's Sentinel</i> (6 Volumes)
<i>DMS Foreign Military Markets</i> (4 Volumes)
<i>World Air Power Journal</i> (11 Volumes)
<i>Naval Institute Guide to World Military Aviation 1995</i>
"Air Forces of the World," <i>Flight International</i> , July 1995
"World Military Aircraft Inventory," <i>Aviation Week and Space Technology</i> , January 1996

The team then used numerous techniques to verify and deconflict the data presented by these sources. The first technique involved sorting and organizing the data because the sources presented their data differently. A second method involved recognizing alternative aircraft designations and sorting them based on more common designations. For example, Sweden's Lockheed C-130 Hercules aircraft are referred to as TP-84s and the Piper PA-31 Navajo carries the Swedish designation of TP-54. Recognizing these variations also helped reduce apparent data conflicts.

Once the team eliminated the apparent data conflicts due to differing source presentation, organization, and alternate designations they compared the data from these

sources for *each and every aircraft entry* in the ToolBook. If multiple sources agreed then they selected this data as the best estimate. For example, the source to source comparison of the MiG-21s possessed by the nation of Mali is presented in Table 2-2.

Table 2-2. Comparison of Inventory Data (Mali MiG-21s)

Source	Inventory Data
<i>Military Balance</i>	11
<i>Jane's Sentinel</i>	11
<i>DMS Market</i>	10
<i>Flight International</i>	10
<i>Naval Institute Guide</i>	10
<i>Aviation Week</i>	10

Note: *World Air Power Journal* did not have current information on Mali's air assets.

In this instance, the team estimated the number of MiG-21s in Mali's inventory to be "10." The underlying premise for using this "preponderance of evidence" technique was that all six sources arrived at their estimates independently. The process logic would be flawed if, for example, *Flight International*, the *Naval Institute* book, and *Aviation Week* used the *DMS Foreign Military Markets* as their primary source. As a whole these four sources would then constitute a single source and the "better" estimate would be "11." The team had to verify the independence of each source to validate the logic in this method. To do this they investigated where each of the seven references obtained their information. For example, *Jane's Sentinel* lists its sources as United Nation's Missions, Embassies, Consulates, the CIA, Defense Ministries of various countries, and the NATO Press Office. *Military Balance* lists fifteen independent first hand sources, few of which are the same as *Jane's Sentinel*. After investigating the sources for each of the seven

references, the team was confident that the "preponderance of evidence" method was logically sound.

This method could not be used in all instances. In some cases, none of the sources agreed or an equal number of sources gave one number and an equal number gave another number. In these cases, the team had to judge the relative credibility of the seven references to provide a best estimate. Publication dates were also taken into consideration when making this judgment. In general, *World Air Power Journal* and the *Naval Institute Guide to World Military Aviation* seemed to be the most credible sources with the *Military Balance*, *Flight International*, and *Jane's Sentinel* not too far behind. These sources (*Naval Guide* and *World Air Power Journal*) provided other means to corroborate much of their information including photographs, tail numbers, and specific aircraft locations. Consequently, their data carried more weight in those instances where a judgment had to be made.

Presentation of Inventory Data

This year's team significantly changed the presentation of the inventory data in an attempt to improve its precision and effectiveness. First, the manufacturer and common (or NATO) code names were added to each aircraft entry by referring to the *World Encyclopedia of Aircraft Manufacturers*, the *Naval Institute Guide to World Military Aviation*, and *Jane's All the Worlds Aircraft 1995-1996*. This information allows for quicker and easier recognition of aircraft. It also provides the user some initial guidance if he chooses to investigate a particular aircraft using outside sources because most aircraft reference books organize their information based on the manufacturer or common

name. In general, adding manufacturer and common names created a more thorough, professional product.

Second, the team broke out aircraft models and variants in as much detail as possible. They did this because different variants may have vastly different capabilities as is the case with the many variants of the MiG-21 aircraft. While such discriminating information was difficult to compile, it was wholly necessary to make the ToolBook effective. As Dr. Mueller stated, "It is precisely this sort of information that is absolutely indispensable. It is this caliber of information which serious scholars and war game designers require."³

The team also included information regarding the distribution of aircraft within a nation's defense branches (e.g., Air Force, Army, Navy, Marines, Coast Guard). They did this both in the narrative and in the inventory. Again, such precision helps to create a complete picture of a nation's airpower situation.

Finally, the team presented the inventory data numerically, with a nation's most abundant aircraft listed first and all variants of a particular type (e.g., F-16A, B, C, D) grouped together. The purpose was to standardize the presentation of the data and allow the user an opportunity to easily recognize which air assets in a nation's inventory are most abundant and which are not. The research team felt that these four changes in the presentation of inventory data, subtle as they may appear, make for a much more valuable, effective ToolBook.

Notes

¹ Rene Francillon, *Naval Institute Guide to World Military Aviation*, (Maryland: Naval Institute Press, 1995), ix.

² Rene Francillon, *Naval Institute Guide to World Military Aviation*, (Maryland: Naval Institute Press, 1995), ix.

³ Karl Mueller, "Evaluation of ACSC Research Project 95-001," (School for Advanced Airpower Studies, Air University, Maxwell AFB, Ala., May 1995), 2.

Chapter 3

Administration and Recommendations

ToolBook Use

This year's team did not alter the basic structure of the ToolBook so using it is still simple and enjoyable. The following description of its operation came from the original ToolBook report with various changes.

The Asymetrix Corporation ToolBook 3.0 software provides a clear, attractive format for presenting the data. Upon entering the program the user receives a brief overview of the ToolBook application followed by several options available to retrieve the data. One method is to navigate to the world map which has been divided into 12 geographic regions. The user can then navigate to the region of interest by selecting one of the 12 region titles on the world map. Once on the regional map the user can get to the country pages by selecting the country of interest from the map or from the country list. A second more direct method to get to the country pages is to go to the index and select the desired country by clicking on the name of the country. Either method brings up the desired individual country page as shown in the Figure 3-1 below.

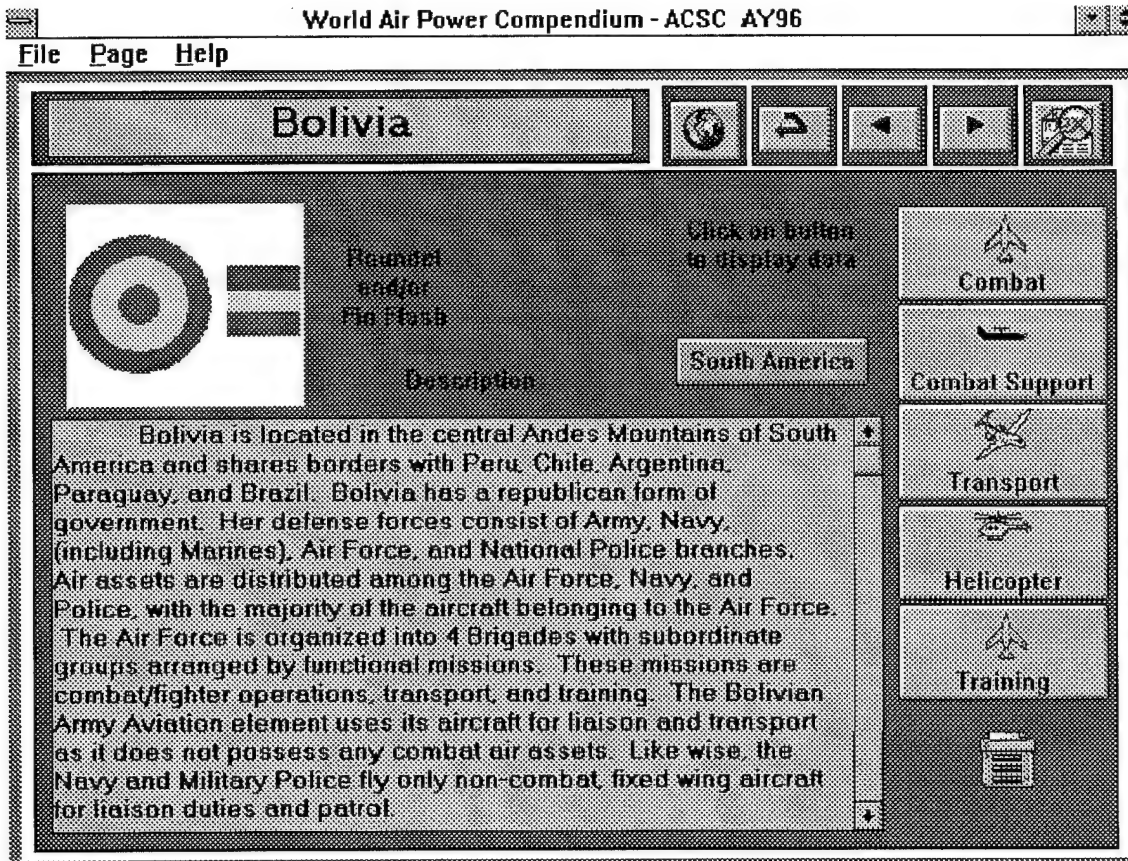


Figure 3-1. Sample "Country" Page

The data available on this country page includes a graphic of the roundel/fin flash that appears on the country's military aircraft and a narrative describing the nation's airpower structure. Aircraft inventory data is grouped by type: combat, combat support, transport, helicopter, and training. If a nation does not have a particular aircraft type then there will be no button for that type on the page. Inventory data appears when the user clicks on the desired aircraft type. Additionally, the print function provides an easy to read, hard copy of the country description and inventory data.

Distribution

Appendix A shows the 35 current ToolBook users. After being shown a demonstration, the USAF ROTC Headquarters recently decided to incorporate the *World Airpower Compendium* into its curriculum. They will provide the funding for its distribution to over 100 ROTC detachments. These detachments and the original users will receive a copy of the updated ToolBook along with a letter accompanying the product (Appendix B) and new and improved loading instructions (Appendix C). This year's team needed to change the loading instructions not only to correct some minor errors and clarify the process, but also to accommodate those institutions which already have the ToolBook software loaded and merely need to update the database. This year's team also worked with the Air Command and Staff College Technical division to place the ToolBook on the Internet. It can be found using the following Internet address:

<ftp://wwwacsc.au.af.mil/public/airpower/>

Recommendations for Future Research

The *World Airpower Compendium* is a valuable product for military students, educators, and war game designers. It has tremendous potential and could be expanded in many different ways. Some future branches within the ToolBook could present data on nations' air defense systems, airfields, air-launched weapons, or even contain a short description of all the aircraft in the ToolBook. The narrative could be expanded to include military alliances to which a nation belongs. However, any expansion must be balanced with the need to keep the ToolBook's size manageable not only for ease of distribution but also for its potential users.

Implementing further changes, large or small, while at the same time updating the core data within the ToolBook will require a much larger research team. This year's team initially intended to expand the ToolBook in a few of the directions listed above. Unfortunately, the condition of the original ToolBook coupled with the team's size forced them to abandon these aspirations. Updating the contents of the ToolBook from scratch and deciphering the software scripting in order to make changes were major undertakings and left insufficient time for other enhancements. If Air Command and Staff College desires to expand the scope of the *World Airpower Compendium* then it must provide the manpower to do so. Next year's team should be composed of a minimum of six to eight officers. A four-person team would be sufficient to update the data within the ToolBook only because this year's team completely overhauled the product.

Chapter 4

Summary

The *World Airpower Compendium* is now a premier reference document for airpower assets throughout the world. It creates a clear picture of the world's airpower situation by coupling current and accurate aircraft inventories with rich narrative descriptions of how nations distribute, organize, and use their air assets. Such information will have a variety of valuable purposes in today's complex, ever-changing global environment.

This year's version is now significantly more comprehensive, accurate, and user friendly. Changes in the ToolBook's content put it on par with many prominent airpower publications, while changes in its operation now make it more efficient and enjoyable to use. The *World Airpower Compendium* may not be as technologically advanced as other ToolBook applications, but it does not need to be. What the it lacks in glitter it surely makes up for in precision, usefulness, and effectiveness. It is a "must-have" resource for military students, educators, and war gaming professionals.

Appendix A

Current World Airpower Compendium ToolBook Users

SCHOOL OR ORGANIZATION	COUNTRY
Air Force Chief of Staff	Cameroon
Canadian Forces Command and Staff College	Canada
Forsvarsakademiet Svanemoellen, Kaserne	Denmark
Flyvevaabnets Officerssskole Jonstrupvej 286	Denmark
College Interarmees de Defense	France
Fachbereich Fuehrungslehre Luftwaffe	Germany
Hellenic National General Staff (War Game Directorate)	Greece
College of Air Warfare	India
Defence Services Staff College	India
Scuola di Guerra Aerea	Italy
Royal Jordanian Air Force Air Staff College	Jordan
Republic of Korea Embassy	Korea
The National Defense Academy	Latvia
The Army Commander, Malawi Army Headquarters	Malawi
The Kamzu Military College	Malawi
Air Command and Staff College	Nigeria
The National War College	Nigeria
Royal Norwegian Staff College	Norway
Avenida Manuel Prado Ugarteche	Peru
Institute de Altos Estudos da Forca Aerea	Portugal

Air Force Information and Resource Center	Singapore
SAFTI Military Institute	Singapore
Singapore Command and Staff College	Singapore
Cuartel Geperal del Ejercito del Aire	Spain
Kommando Generalstabskurse	Switzerland
Militarische Führungsschule	Switzerland
Stab Operative Schulung	Switzerland
Stabs-und Kommandantenshule Armeeausbildungszentrum	Switzerland
Turkmenistan Military High School	Turkmenistan
Joint Services Defence College	United Kingdom
Royal Air Force College, Cranwell	United Kingdom
Royal Air Force Staff College	United Kingdom
Royal College of Defence Studies	United Kingdom
Army Command and General Staff College	United States of America
Naval War College	United States of America

Appendix B

Typical Letter to Accompany Final Product (Foreign Nations)

Air Command and Staff College
225 Chennault Circle
Maxwell AFB, AL 36112-6426

Air War College
Capital City
Country

Dear _____

The Air Command and Staff College of the United States Air Force is happy to present you with a free copy of the second edition of our *World Airpower Compendium*. This computer program is an update of what we believe to be the airpower assets of all the world's nations. We hope you found many uses for last year's version and send you this new edition as a gesture of good will, and in the hope that it will continue to generate friendship between nations and between our schools as comrades in arms.

The program is public domain freeware. The information has been developed from totally unclassified and publicly available sources. You may copy and distribute this program however you wish. The new edition is a product of four Air Command and Staff College students in the class of 1996 for whom it was a research project. You will recognize many improvements and enhancements in this year's version.

The program is still easy to use. It will run on any computer with at least twelve megabytes of available hard disk space and which runs Windows 3.1 or higher operating system. A copy of the new version will be available on the Internet sometime this summer.

We believe that you will continue to find the program a handy desktop reference. We would welcome any new comments about usefulness or accuracy. Please send your comments to the address below.

Our very best wishes,

Attachment: Program Loading Instructions
Computer Disks (3)

ACSC/CAB
225 Chennault Circle
Maxwell AFB
Alabama 36112-6426
USA

Internet address: <ftp://wwwacsc.au.af.mil/public/airpower/>

Appendix C

Program Loading Instructions

The World Airpower Compendium (96.01 Version) is an updated, comprehensive database of all the world's airpower assets. The disks you have received contain all of the files you will need to get the updated program running on your computer. If you have the previous version of the ToolBook with all its associated software you can skip to the section titled "Revising the ToolBook" and follow those instructions. If you are loading the ToolBook for the first time follow the steps below in the section titled "New ToolBook Users." The program requires Windows 3.1 and at least 12MB of hard disk space on your computer and it runs best using at least a 486 processor.

New ToolBook Users

1. On your hard drive, create a directory called "**MTB30**."
 2. Copy all of the files from the disk labeled "**Airpower, Disk 1 of 1**" to the "**MTB30**" directory. There should now be 2 files (*airpower.exe* and *pkunzip.exe*) in "**MTB30**."
 3. a. Place the disk labeled "**Runtime, Disk 1 of 2**" in drive "a:"

b. In the Windows File Manager, go to "**MTB30**" directory. Use the "File Run" command and type the following: *c:\mtb30\pkunzip.exe a:\runtime.zip*

c. Follow the directions on the screen:
 - When the computer asks you to "Insert the last disk of backup set—Press a key when ready" put the "**Runtime Disk 2 of 2**" in drive "a" and hit any key.
 - When the computer asks you to "Insert Disk #1—Press a key when ready" put in "**Runtime Disk 1 of 2**" in drive "a" and hit any key.
 - When the computer asks you to "Insert Disk #2—Press a key when ready" put in "**Runtime Disk 2 of 2**" again and hit any key.
 - You should now have 3 files in the "**MTB30**" directory:
airpower.exe pkunzip.exe runtime.exe
- NOTE: You may have to reinitialize the file manager to find runtime.exe

4. In the "*MTB30*" directory, run (double click) *runtime.exe*
5. Copy *c:\mtb30\asym.ini* to *c:\windows\asym.ini*
6. Run (double click) *c:\mtb30\airpower.exe*
7. Run (double click) *c:\mtb30\mtb30run.exe* and open file *airpower.tbk*

You are now ready to use the program.

8. To reopen the ToolBook after it has been closed use the File manager to get to the "*MTB30*" directory and complete step #7 again.

Revising The ToolBook

These steps should only be followed if you have already loaded the ToolBook[®] and still have all the associated software in the "*MTB30*" directory from last year.

1. Place the disk labeled "*Airpower, Disk 1 of 1*" in drive "a".
2. Use the File Manager to get to the "*MTB30*" directory you created last year. Replace the old "*airpower.exe*" file and with the new "*airpower.exe*" from the "a" drive.
3. Run (double click) the new *airpower.exe* file. This will "inflate" the new updated ToolBook.
4. Run (double click) *c:\mtb30\mtb30run.exe* and open file *airpower.tbk*
5. You are now ready to use the program.
6. To reopen the ToolBook after it has been closed use the File manager to get to the "*MTB30*" directory and complete step #7 from above.

Bibliography

Articles/Periodicals

- "Aircraft Service Markings." *Joint Service Recognition Journal* (December 1983): insert.
- "Air Forces of the World." *Flight International* 148, no. 4479 (July 1995): 29–65.
- "Defense." *Flight International* 4488–4513 (September 1995–March 1996).
- "Military Aviation Review." *World Air Power Journal* 12–22 (Summer 1993–Winter 1995).
- "Roundel Foldout Supplement." *Air Forces Monthly* 87 (June 1995): insert.
- Rozendaal, Frank G. "White Russia." *Air Forces Monthly* 91 (October 1995): 22–29.
- "Strength of the RAF." *Royal Air Force* 1995, no. 7 (1995): 41–44.
- "World Military Aircraft Inventory." *Aviation Week and Space Technology* 144, no. 2 (January 1996): 179–194.

Books

- Beaver, Paul, ed. *Jane's Sentinel North Africa*. Surrey: Sentinel House, 1995.
- . *Jane's Sentinel South China Sea*. Surrey: Sentinel House, 1995.
- . *Jane's Sentinel The Balkans*. Surrey: Sentinel House, 1995.
- . *Jane's Sentinel The Gulf States*. Surrey: Sentinel House, 1995.
- Central Intelligence Agency. *The World Fact Book*. Washington: Brasseys, 1995.
- Corely, Felix, ed. *Jane's Sentinel Commonwealth of Independent States*. Surrey: Sentinel House, 1995.
- Dushkin Group. *Global Studies Middle East*. Connecticut: Brown and Benchmark, 1995.
- English, Adrian, ed. *Jane's Sentinel Central America and The Caribbean*. Surrey: Sentinel House, 1995.
- Europa World Yearbook*. Kent: Staples Printers, 1995.
- Forecast International/DMS. *Foreign Military Markets Asia, Australia, and Pacific Rim*. Connecticut: Forecast International, 1995.
- . *Foreign Military Markets Latin America, Caribbean*. Connecticut: Forecast International, 1995.
- . *Foreign Military Markets Middle East, Africa*. Connecticut: Forecast International, 1995.
- . *Foreign Military Markets NATO and Europe*. Connecticut: Forecast International, 1995.
- Francillon, Rene J. *Naval Institute Guide to World Military Aviation 1995*. Maryland: Naval Institute Press, 1995.

- Gunston, Bill. *World Encyclopedia of Aircraft Manufacturers*. Maryland: Naval Institute Press, 1993.
- Hunter, Brian, ed. *The Statemen's Yearbook 1994-1995*. New York: St. Martin Press, 1994.
- International Institute for Strategic Studies. *Military Balance 1994-1995*. London: Brasseys, 1995.
- . *Military Balance 1995-1996*. London: Brasseys, 1996.
- Jackson, Paul. *Jane's All the World's Aircraft 1995-1996*. Surrey, UK: International Thomas Publishing Co., 1995.
- Slade, Carole, William Giles Campbell and Stephen Vaughan Ballou. *Form and Style Research Papers, Reports, Theses*. Boston: Houghton Mifflin.
- Taylor, Michael J., ed. *Encyclopedia of the World's Air Forces*. New York: Facts on File, 1988.
- United States Air Force. *The Tongue and Quill*, AFH 37-137. 31 August 1994.

Multimedia/Other

- ABC-CLIO. *Exergy, The Source of Current World Information CD-ROM*. California: ABC-CLIO, December 1995.
- Al-Ghatam Jaber, et al. "The World Air Power Compendium," Project 95-001. Maxwell AFB, Ala.: Air University Press, April 1995
- Mueller, Karl. "Evaluation of ACSC Research Project 95-001." School for Advanced Airpower Studies, Air University, Maxwell AFB, Ala., May 1995. Photocopy.
- "US Recognized Countries of the World." United States Department of State, Washington, D.C. Government Printing Office, 1995.